



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: **NAGAI, Shozo et al.**

Group Art Unit: 1742

Serial No.: **09/878,333**

Examiner: **H.D. Wilkins, III**

Filed: **June 12, 2001**

P.T.O. Confirmation No.: 2178

For: **A NI-BASE BRAZING ALLOY**

**RESPONSE UNDER 37 CFR §1.111**

Commissioner for Patents  
Washington, D.C. 20231

November 18, 2002

Sir:

In response to the Office Action dated **July 18, 2002**, applicants request favorable reconsideration of the above-identified application. Claims 1 and 2 are pending.

The Examiner has rejected claims 1 and 2 under 35 U.S.C. §103 (a) as being obvious over *Nagai et al.* (JP 09-225679) in view of *Stern* (U.S. 4,507,264). Applicants respectfully submit that the present invention embodied in claims 1 and 2 would not have been obvious to one skilled in the art in light of these references. Based on a number of distinctions between the references, one skilled in the art would not have been motivated to combine the references. In addition, there is no reasonable expectation of success. The cited references do not teach any of the features and advantages of the present invention.

The present invention is directed to a brazing alloy which is characterized in comprising Cr in an amount of 25 to 35% by weight, P in an amount of 4 to 8% by weight, Si in an amount of 3 to 6% by weight, wherein the total amount of P and Si is 9 to 11.5% by weight, at least one selected from a group consisting of Al, Ca, Y and misch metal in an amount of 0.01 to 0.10% by weight, and

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the balance of Ni and unavoidable impurities.

The present inventors had made investigations to overcome disadvantages of prior art such as *Nagai et al.*, which is one of the cited references, and found out that an increased amount of Cr improves strength of the alloy, a specified amount of P and Si leads to the formation of a hypoeutectic structure, and a certain amount of Al, Ca, Y and misch metal decreases oxygen content which in result prevents slag (Cr oxides) formation when brazed (see page 2, line 2 from the bottom to page 3, line 6; and page 5, lines 19-22). The present invention comprising the above features, therefore, provides a brazing alloy which prevents forming slags when brazed, which attains high strength of the brazed joint, which has a melting point as low as at about 1100°C, and which also has good wettability, and an excellent corrosion resistance to sulfuric acid. These remarkable advantages are presented in examples summarized in Table 1 of this application (see page 9).

Although each of the cited references relates to a Ni-based brazing alloy, neither of them teaches effects of preventing slag formation as in the present invention.

The *Nagai et al.* reference discloses a Ni-based brazing alloy that contains 10-30 wt% Cr, 2-11 wt% P and 1-10 wt% Si, where P+Si is 10-13 wt%, with the balance being Ni, but does not describe anywhere a brazing metal comprising at least one of Al, Ca, Y and misch metal. *Nagai et al.* also does not teach the effect of preventing slag formation, nor attaining a high strength of the brazed joint when brazed.

The property of the reference's brazing alloy is shown in the present specification as the control alloys (see page 10, Table 2, (a) and (b) of the present specification). Here, both the control alloys (a) and (b) fail to prevent slag formation and show a low level in transverse rupture strength.

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*Stern* teaches a Ni-based brazing alloy which contains Y in amount of 0.01-0.06 wt% and Al in amount of 2.5-4.5 wt%. *Stern* also teaches that Y is added to combine with Cr and Al to form an improved micro-structure which is resistant to sulfidation and oxidation (*see* column 4, lines 29-31). *Stern* does not teach any of the effect of preventing slag formation. This means that the purpose of adding Y in this reference is completely different from that of adding Y in the present invention. Since *Stern* does not teach or suggest any benefit to simply adding Y to any Ni-based alloy, one skilled in the art would have no motivation to do so.

In addition, the present invention teaches an Al content of less than 0.01 to 0.10 wt% if Y or Ca and misch metal are also present. Y is not present to react with Al to create an improved micro-structure.

It is also clear that the brazing alloy of *Stern* has a brazing temperature as high as 2150 to 2300°F (see column 2, line 26), corresponding to 1176 to 1260°C, which does not fulfill the desired brazing temperature of the present invention, nor of *Nagai et al.*

One skilled in the art would not expect success in combining the Y of *Stern* with the alloy of *Nagai et al.* without also adding Al in an amount of 2.5-4.5 wt%, thus taking the combination outside the scope of claims 1 and 2. Hence, Applicants respectfully submit that *Stern*, in essence, teaches away from only adding Y to a Ni-based alloy, as the Examiner suggests, as *Stern* teaches a larger wt% of Al is necessary to react with Y.

In addition, one skilled in the art would in general not have been motivated to combine the references due to the stark differences in brazing temperature. One skilled in the art would not anticipate that additional elements added to a Ni-based alloy with a brazing temperature as high as

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2150 to 2300°F (1176 to 1260°C) would obviously result in an improvement to a Ni-based alloy with significantly lower brazing temperatures.

Wherefore the advantages of adding Y or Al, Ca and misch metal in trace amounts to a Ni-based alloy such as *Nagai et al.* were unexpected and obtained only after significant experimentation.

It is believed that this submission is fully responsive to the Office Action dated **July 18, 2002**.

Accordingly, it is believed that the application is in condition for allowance. Favorable consideration is earnestly solicited.

Should the Examiner deem that any further action by Applicants would be desirable to place the application in better condition for allowance, the Examiner is encouraged to telephone Applicants' undersigned attorney.

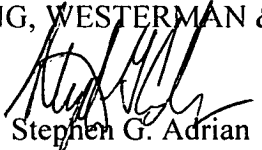
If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Attachment: Petition for Extension of Time

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